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site, but this point will be investigated further before any definite recommendation is made as to the location of the substations. It is purposed to continue the work at the main station throughout at least one sun-spot period, and for two or three summers at the two substations.

With the foresight and thoroughness with which the committee has made its plans and preliminary investigations as an earnest of the wise future administration of its trust, with the powerful equipment for which these recommendations call, and with plans founded on the notable advances of the past twenty years, astrophysicists may well hope for a decade of unparalleled progress in the field of solar physics.

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## PLANETARY PHENOMENA FOR JULY AND AUGUST, 1904.

BY MALCOLM MCNEILL.

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### PHASES OF THE MOON, PACIFIC TIME.

Last Quarter, July 5, 8 <sup>h</sup> 54 <sup>m</sup> P.M.	Last Quarter, Aug. 4, 6 <sup>h</sup> 3 <sup>m</sup> A.M.
New Moon, " 12, 9 27 P.M.	New Moon, " 11, 4 58 A.M.
First Quarter, " 19, 12 49 P.M.	First Quarter, " 17, 8 27 P.M.
Full Moon, " 27, 1 42 A.M.	Full Moon, " 25, 5 2 P.M.

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The Earth is in aphelion July 4th, 5 P.M., Pacific time.

*Mercury* is a morning star on July 1st, too near the Sun to be seen, rising about three quarters of an hour before sunrise. It rapidly approaches the Sun, passes superior conjunction, and becomes an evening star on July 9th. By August 1st it has receded far enough from the Sun to set rather more than an hour after sunset, and this interval does not change very much until after the middle of the month. It reaches greatest east elongation on the evening of August 19th. Its apparent distance from the Sun will then be  $27^{\circ} 24'$ . This elongation is much greater than the average greatest elongation, since the planet passed its aphelion on August 17th, only two days before. After passing greatest elongation the planet approaches

the Sun quite rapidly, and at the end of the month it sets about half an hour after sunset. It is in close conjunction with *Mars* on the morning of July 2d, but both bodies are almost too near the Sun for observation at that time. Also, it is in conjunction with *Venus* only ten hours after passing conjunction with the Sun.

*Venus* is a morning star too near the Sun to be easily seen on July 1st. It comes to superior conjunction July 7th, 11 P.M., Pacific time. It then becomes an evening star, and will remain so until the following spring. Its apparent distance from the Sun increases rather slowly, and its path among the stars tends toward the south; so the interval between the setting of the Sun and of the planet does not grow very rapidly. On August 1st it is only thirteen minutes, and on August 31st about forty minutes. Notwithstanding its brightness, now at its minimum, it will not be easy to see it with the naked eye until nearly the close of August. It is in perihelion on July 23d, but its orbit is so nearly circular that the difference between greatest and least distance from the Sun is less than half a million miles.

*Mars* is now getting far enough away from the Sun to be seen as a morning star. On July 1st it rises about forty minutes before sunrise, on August 1st an hour and a half before, and on August 31st well over two hours before. During the two months it moves over  $40^{\circ}$  eastward and  $6^{\circ}$  southward in *Gemini*. During the middle and latter part of August it is a few degrees south of *Castor and Pollux*,  $\alpha$  and  $\beta$  *Geminorum*.

*Jupiter* rises half an hour after midnight on July 1st, and by the end of August at a little before 9 P.M. It moves eastward in the eastern part of *Pisces* until August 20th, about  $3^{\circ}$ , and then begins to move slowly westward.

*Saturn* rises before 10 P.M. on July 1st, and at about 5:40 on August 30th. So it is in fair position for early-evening observation in August. It comes to opposition with the Sun on August 10th, and is then above the horizon during the entire night. During the two months it moves about  $4^{\circ}$  westward in the constellation *Capricorn*, somewhat east of  $\alpha$  and  $\beta$ , the principal stars of the constellation. The rings apparently widen out a trifle from their minimum in June, on account of the Earth's motion in reference to their plane; but aside

from this temporary increase in apparent breadth, there will be a general progressive diminution until the motion of the planet brings the plane of the rings into coincidence with the Earth.

*Uranus* crosses the meridian shortly after 11 P.M., on July 1st, and at 7 P.M. on September 1st. So it is in fair position for evening observation. It moves a little less than  $2^{\circ}$  westward in the western part of *Sagittarius*, becoming stationary early in September. No bright star is near enough to make the planet's identification easy.

*Neptune* is a morning object in *Gemini*. By the end of August it rises not long after midnight.

It will be worth while to look for the annual *Perseid* meteors during the second week in August. The meteors are so scattered that we get some every year, while there is no great shower occurring at intervals of several years,—or failing to come to time in anything like its hoped for brilliancy, as happened with the *Leonids* a few years ago.

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